REMARKS/ARGUMENTS

Claims 1, 4, 6, 8 and 10-25 were pending in the Application. By this amendment, claims 1, 4 and 21 are being amended to improve their form, claims 11-13, 16-18 and 22-25 are being cancelled, and claims 14, 15, 19 and 20 are being amended to change their dependency in view of the cancellation of claims. Therefore, claims 1, 4, 6, 8, 10, 14, 15 and 19-21 remain pending in the Application. No new matter is involved. Reconsideration and allowance are respectfully requested.

In Paragraph 2 on page 2 of the Office Action, claims 1 and 21 are rejected under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent 5,518,624 of Filson et al. or Japanese JP4-83585 of Asahi. This rejection is respectfully traversed, particularly in view of claims 1 and 21 as amended herein.

In the remainder of the Office Action, various claims are rejected under 35 U.S.C. § 103(a) as being obvious in view of combinations of references. In Paragraph 5 on page 3, claim 22 is rejected as unpatentable over Filson et al. in view of Ohmi et al. In Paragraph 6 on the same page, claim 4 is rejected as unpatentable over U.S. Patent 5,651,836 of Suzuki in view of Filson et al. In Paragraph 7 on page 4 of the Office Action, claim 6 is rejected as unpatentable over Suzuki and Filson et al. and further in view of U.S. Patent 4,973,563 of Prigge et al. In Paragraph 8 on the same page, claims 12, 14, 16 and 18-20 are rejected as unpatentable over Suzuki and Filson, and further in view of U.S. Patent 5,466,389 of Ilardi et al. In Paragraph 9 on page 5 of the Office Action, claims 13, 15 and 17 are rejected as unpatentable over Suzuki, Filson et al. and Ilardi et al., and further in view of Prigge et al. In Paragraph 10 on page 6 of the Office Action, claim 23 is rejected as unpatentable over Suzuki and Filson, and further in view of Ohmi et al. In Paragraph 11 on the same page, claim 24 is rejected as unpatentable over

Suzuki, Filson et al. and Ohmi et al., and further in view of Prigge et al. In Paragraph 12 on page 7 of the Office Action, claims 4 and 8 are rejected as unpatentable over U.S. Patent 5,484,748 of Suzuki et al. in view of Filson et al. In Paragraph 13 on the same page, claims 6 and 10 are rejected as unpatentable over Suzuki et al. and Filson et al., and further in view of Prigge et al. In Paragraph 14 on the same page, claims 12, 14, 16 and 18-20 are rejected as unpatentable over Suzuki et al. and Filson et al., and further in view of Ilardi et al. In Paragraph 15 on page 8 of the Office Action, claims 13, 15 and 17 are rejected as unpatentable over Suzuki et al., Filson et al. and Ilardi et al., and further in view of Prigge et al. In Paragraph 16 on page 9 of the Office Action, claims 23 and 25 are rejected as unpatentable over Suzuki et al. and Filson et al., and further in view of Ohmi et al. In Paragraph 17 on page 10 of the Office Action, claims 24 and 11 are rejected as unpatentable over Suzuki et al., Filson et al. and Ohmi et al., and further in view of Prigge et al. These rejections are respectfully traversed, as discussed hereafter.

In order to more clearly distinguish claims 1, 4 and 21 over the prior art, such claims are being amended herein. More specifically, claims 1 and 21 are being amended to add the limitations of "chelating agent" and "surfactant", and "in the form of pit water". Claim 4 is being amended to add the limitations of "chelating agent", "surfactant", "in the form of pit water", and "in a waiting period between steps in a silicon wafer production process". The limitation of "chelating agent" is described at line 26 of page 14 through line 3 of page 15 of the specification. The limitation of a "surfactant" is set forth in claims 16-18, 22 (original claim 2), and in claim 23 (original claim 5). The limitation "in the form of pit water" is described at lines 9-11 of page 7, at lines 17-24 of page 13, and at lines 17-19 of page 19. The limitation "in a waiting period between steps in a silicon wafer production process" is described at line 27 of page 7 through line 4 of page 8, at line 26 of page 8 through

line 3 of page 9, at lines 21-25 of page 18, and at lines 6-11 of page 19, of the specification.

With respect to claim 1, such claim was rejected in the Office Action as being anticipated by Filson et al. or Asahi. As amended herein, claim 1 reads as follows:

> 1. A storage water used for storage of a silicon wafer in water, wherein the storage water is ultra pure water containing Cu at a concentration of 0.01 ppb or less, a chelating agent and a surfactant, and used in the form of pit water.

Because the storage water of claim 1 is ultra pure water containing Cu at a concentration of 0.01 ppb or less, such water in accordance with the present invention can prevent degradation of oxide dielectric breakdown voltage which would occur due to the storage of the silicon wafer in water (see lines 5-9 of page 10 of the specification). Because of the presence of a chelating agent, the water is more effective in preventing contamination of the metal impurities such as Cu (see line 26 of page 14 through line 3 of page 15 of the specification). Addition of a surfactant to the storage water improves particle removal performance of the storage water (see lines 12 and 13 of page 6 of the specification). Used in the form of pit water, the concentration of added surfactant can be maintained at a certain level (see lines 17-19 at page 13 of the specification).

According to the Office Action, Filson et al. and Asahi disclose ultra pure water containing Cu at a concentration on the order of that of the present invention. It is further asserted that the intended use of the water is not germane to determination of patentability of the invention (see item 2 on page 2 of the Office Action). However, none of the cited references, including Filson et al. and Asahi, disclose a storage water wherein the storage water is ultra pure water containing Cu at a concentration of 0.01 ppb or less, a chelating agent and a surfactant, and

used in the form of pit water. Therefore, claim 1 is submitted to clearly distinguish patentably over such references.

not germane in a comp. claim

According to the Office Action, Ilardi et al. discloses a cleaning solution with added chelating agent and a surfactant. Filson et al. and Suzuki are said to be concerned with contaminant removal from surface water. Therefore, according to the Office Action, it would have been obvious to one of skill in the art to add a chelating agent and a surfactant in the manner of Ilardi (see lines 12-19 of page 4 of the Office Action).

However, both Filson et al. and Suzuki are primarily concerned with the production method of ultra pure water, and disclose a complicated apparatus for producing ultra pure water (see Figs. 1-4 of Filson et al. and the English abstract of Asahi). There is no description or suggestion of adding another component. On the other hand, Ilardi et al. discloses a strong cleaning agent that can clean the surface of contaminated wafer perfectly (see Examples 1-10 of Ilardi et al.). However, Ilardi et al. has a strong cleaning effect only with its composition. One of ordinary skill in the art when provided with the teaching of Ilardi et al. would not think to produce ultra pure water with controlled high purity with using the complicated apparatus of Filson et al., or the like and applying the ultra pure water to the cleaning solution containing a chelating agent and a surfactant according to Ilardi et al.

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According to the Office Action, Ohmi et al. suggests addition of surfactants to the rinse water (see item 10 on page 6 of the Office Action). However, Ohmi et al., as well as Ilardi et al., teach only that a cleaning agent of ultra pure water to which a surfactant is added has sufficient cleaning ability. Therefore, there would be no motivation to control the Cu concentration at the level recited in claim 1, in the manner of Filson et al. or the like.

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Moreover, none of the cited references, including Filson et al. and Asahi, disclose or suggest a storage water that is used in the form of pit water. The

no germane in Composition claim

expression "pit water" refers to storage water stored in a storage container used for storage of a silicon wafer in a state in which the water is not introduced, drained, or circulated, so that the storage water is stagnant (see page 13 of lines 20-24 of the specification). In both Filson et al. and Asahi, the water is used in a state in which it is introduced, drained, and circulated (see Figs. 1-4 of Filson et al. and the English abstract of Asahi). Consequently, it is difficult to maintain the concentration of surfactant at a certain level when a surfactant is added. On the other hand, the storage water of the present invention can maintain the concentration of surfactant at a certain level due to being used in the form of pit water (see lines 17-19 of page 13 of the specification). There is no description or suggestion of this in any of the cited references.

Moreover, and as set forth in claim 1, storage water in accordance with the invention is inherently "storage water" of a silicon wafer. On the other hand, the cited references such as Filson et al. provide a "cleaning agent" for rinsing the wafer. Consequently, they are not concerned with each other, directly. According to the Office Action, the intended use is not germane to a determination of patentability. However, even if something has a known composition, in a case where a new characteristic is found which has an unexpected effect in applying the new use, patentability of such invention should be allowed.

only applies to method of use

As described in Filson et al., in a cleaning step of the wafer, the techniques for removing contaminant in the cleaning agent have been studied (see line 25 of page 2 through line 2 of page 3 of the present specification). However, even when cleaning is performed while the concentration of contaminant in the cleaning solution is controlled in order to produce a silicon wafer having a clean surface, the final wafer sometimes becomes defective in that its oxide dielectric breakdown voltage is degraded. This cause has been unknown (see lines 11-16 of page 3 of the specification). Therefore, the inventors of the present invention analyzed the causes

and found that such degradation is caused by storing the silicon wafer in a storage water in a waiting period between steps in a silicon wafer production process (see lines 2-27 of page 11 of the specification). This conceivable cause is such that when Cu exists in the storage water, it electrochemically reacts with Si to precipitate ions, so that defects are generated on a silicon wafer, the defects due to the reaction remain after the cleaning step, and conceivably cause degradation of the quality of an oxide film (see lines 1-18 of page 12 of the present specification). Therefore, the inventors of the present invention completed such invention in consideration of the composition of the storage water in a waiting period between steps in a silicon wafer production process.

The cited references do not describe or suggest this. The references, including Filson et al., do not recognize a problem in storing a wafer in water in a period between steps in a production process, or using storage water in the manner of the present invention. Therefore, it is impossible for one of ordinary skill in the art to arrive at the "storage water" of the present invention, even if such person happens upon a "cleaning agent" similar to the "storage water" of the present invention by combining the various cited references, such as Filson et al. Consequently, the subject matter of claim 1 provides an unexpected effect in a new use of storing a wafer in water that can prevent degradation of oxide dielectric breakdown voltage, which would occur due to the storage of a silicon wafer in water (see lines 5-9 of page 10 of the present specification). Therefore, claim 1 is again submitted to clearly distinguish patentably over the cited references.

As amended herein, claim 1 is submitted to clearly distinguish patentably over Filson et al. and Asahi. Moreover, claim 1 is not obvious over any of the cited references and as such, the subject matter of such claim exhibits an unexpected effect that can prevent degradation of oxide dielectric breakdown voltage, which

would occur due to the storage of the silicon wafer in water. Accordingly, claim 1 is also not obvious over the cited references for this reason.

Claim 21 was rejected in the Office Action as anticipated by Filson et al. or Asahi, in the same manner as claim 1 discussed above. As amended herein, claim 21 reads as follows:

> 21. A regulating method of a storage water used for storage of a silicon wafer in water, wherein the concentration of Cu in the storage water, which is ultra pure water containing a chelating agent and a surfactant, is regulated to 0.01 ppb or less in the form of pit water.

As so amended, claim 21 sets forth the feature in accordance with the invention of a regulating method of storage water used for storage of a silicon wafer in water, wherein the concentration of Cu in the storage water, which is ultra pure water containing a chelating agent and a surfactant, is regulated to 0.01 ppb or less in the form of pit water. By regulating the storage water in this manner, the storage water defined in claim 21 keeps the wafer stored in the water clean and prevents degradation of the oxide dielectric breakdown voltage of the silicon wafer.

Neither Filson et al. nor Asahi disclose or suggest a regulating method for storage water wherein the storage water is ultra pure water containing Cu at a concentration of 0.01 ppb or less, a chelating agent and a surfactant, and the storage water is regulated to 0.01 ppb or less in the form of pit water, as discussed above in connection with claim 1. Consequently, as amended herein, claim 21 is submitted to clearly distinguish patentably over the cited references. Nor is it possible that one of ordinary skill in the art could combine Filson et al. and Asahi with the other references, as discussed above in connection with claim 1. Even if one of ordinary skill in the art were to combine Filson et al. and Asahi with the other cited references, such person would not derive claim 21 as it is concerned with "storage water". This is because the cited references are not concerned with a

"cleaning agent". Thus, claim 21 is submitted to clearly distinguish patentably over Filson et al. or Asahi, or any possible combination of such references with the other cited references.

Regarding claim 4, the Office Action rejects such claim as unpatentable over U.S. Patent 5,651,836 of Suzuki in view of Filson et al. In response, Applicant is amending claim 4 herein. As so amended, claim 4 reads as follows:

> 4. A method of storing a silicon wafer in water, comprising the steps of preparing storage water, which is ultra pure water containing Cu at a concentration of 0.01 ppb or less, a chelating agent and a surfactant, and storing a silicon wafer in the prepared storage water in the form of pit water in a waiting period between steps in a silicon wafer production process.

Thus, according to the features of claim 4, ultra pure water contains Cu at a concentration of 0.01 ppb or less, a chelating agent, and a surfactant. This provides the effect that degradation of oxide dielectric breakdown voltage is prevented. This would otherwise occur due to the storage of a silicon wafer in the water, as described above in connection with claims 1 and 21 (see lines 7-11 of page 19 of the specification). And because the silicon wafer is stored in water "in a waiting period between steps in a silicon wafer production process", the method in accordance with claim 4 can prevent adhesion of polishing slurry to a silicon wafer, which would occur when the wafer is left in air during the waiting period between steps (see lines 6-9 of page 19 of the specification).

According to the Office Action, because Suzuki teaches storing wafers in ultra pure water, Filson et al. teaches ultra pure water containing Cu in an amount below 0.005 ppb, and it is imperative to use water free of all contaminants in semiconductor processing, that therefore it would have been obvious to one of ordinary skill in the art to employ the ultra pure water of Filson et al. in the method

of Suzuki (see page 3, item 6 of the Office Action). However, Suzuki inherently discloses a method for "cleaning" the wafer in the cleaning step (see column 1, lines 6-15 of Suzuki). Such reference does not disclose or suggest "storing" the wafer in water in a waiting period between steps such as a "polishing step" or a "cleaning step" in silicon wafer production.

As previously described, although in a cleaning step the techniques of removing contaminants in the cleaning agent have been studied, even when cleaning is performed in order to produce a silicon wafer having a clean surface, the final wafer sometimes becomes defective in that the oxide dielectric breakdown voltage is degraded. Consequently, the present inventors analyzed the causes of this and found that the degradation is caused by storing a silicon wafer in a storage water in a waiting period between steps in a production process. The present inventors completed the present invention in consideration of the composition of storage water and the storage method. Therefore, inasmuch as the cited references such as Suzuki do not recognize the problem in storing a wafer in water during the period between the steps in a production process, to say nothing of using storage water like that of the present invention, it is impossible for one of ordinary skill in the art to derive the "storage method" of the present invention. This is so even if such person arrives at a "cleaning agent" similar to the "storage water" of the present invention by combining the cited references such as Suzuki.

Furthermore, the processes in accordance with the cited references, such as Suzuki, are used in a state in which water is introduced, drained, and circulated in a container used for immersion of a silicon wafer in water (see Figs. 1-3 of Suzuki, for example). However, there is no description or suggestion of storing the wafer in the form of pit water. The method in accordance with claim 4 can maintain the concentration of the surfactant at a certain level because of being used in the form of pit water. There is no description of this in any of the cited references, so that a

person of ordinary skill in the art could not arrive at the invention of claim 4 when armed with the teachings of such references.

Moreover, and as discussed above in connection with claim 1, one of ordinary skill in the art would not think to produce ultra pure water containing Cu below 0.01 ppb with using complicated apparatus such as that described in Filson et al., and by applying the ultra pure water to the cleaning solution containing a chelating agent and a surfactant as described in the other reference.

Therefore, claim 4 is submitted to clearly distinguish patentably over the cited references.

In conclusion, claims 1, 4 and 21 as amended herein are submitted to clearly distinguish patentably over the cited references. Moreover, claims 6, 8, 10, 14, 15, 19 and 20 depend, directly or indirectly from, and add further limitations to claim 4 so that such claims are also submitted to clearly distinguish patentably over the cited references. Therefore, reconsideration and allowance are respectfully requested.

In view of the foregoing, it is respectfully submitted that the application is in condition for allowance. Reexamination and reconsideration of the application, as amended, are requested.

If for any reason the Examiner finds the application other than in condition for allowance, the Examiner is requested to call the undersigned attorney at the Los Angeles, California telephone number (213) 337-6846 to discuss the steps necessary for placing the application in condition for allowance.

If there are any fees due in connection with the filing of this response, please charge the fees to our Deposit Account No. 50-1314.

Respectfully submitted,
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